Universal Future Average Of A Time Series Type Sequence

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ABSTRACT

In this research investigation, the author has detailed a novel Future Average of a Time Series Type Sequence.

INTRODUCTION

A lot of literature is available in the domain of Future Averages. The reader can refer to the types of Future Averages dealt in the subject of Time Series Analysis.

THEORY (AUTHOR’S FUTURE AVERAGE OF A TIME SERIES TYPE SEQUENCE MODEL)

Firstly, we define the definitions of Similarity and Dissimilarity as follows:

Given any two real numbers a and b, their Similarity is given by

\[ \text{Similarity}(a,b) = \begin{cases} a^2 & \text{if } a < b \\ b^2 & \text{if } b < a \end{cases} \]

and their Dissimilarity is given by

\[ \text{Dissimilarity}(a,b) = \begin{cases} ab - a^2 & \text{if } a < b \\ ab - b^2 & \text{if } b < a \end{cases} \]

Given any time series or non-time series sequence of the kind

\[ S = \{y_1, y_2, y_3, \ldots, y_{n-1}, y_n\} \]

We can now write the Future Average of the Time Series Type Sequence \( S \), i.e., \( y_{n+1} \) as

\[ y_{(n+1)S} = \left\{ \begin{array}{c} \frac{\sum_{j=1}^{n} \text{Total Exhaustive Similarity}(y_i, y_j)}{\text{Total Exhaustive Similarity}(y_i, y_j) + \text{Total Exhaustive Dissimilarity}(y_i, y_j)} \\ \sum_{i=1}^{n} y_i \end{array} \right\} \]

and

\[ y_{(n+1)DS} = \left\{ \begin{array}{c} \frac{\sum_{j=1}^{n} \sum_{j\neq i} \text{Total Exhaustive Dissimilarity}(y_i, y_j)}{\text{Total Exhaustive Similarity}(y_i, y_j) + \text{Total Exhaustive Dissimilarity}(y_i, y_j)} \\ \sum_{i=1}^{n} y_i \end{array} \right\} \]
The definitions of Total Exhaustive Similarity and Total Exhaustive Dissimilarity are detailed as follows:

**Total Exhaustive Similarity** \((y_i, y_j)\) =

\[ \text{Similarity}(y_i, y_j) + \text{Similarity}(S_1, S_2) + \text{Similarity}(S_3, S_4) + \text{Similarity}(S_4, S_5) + \cdots + \text{Similarity}(S_k, S_{k+1}) \]

\[ \text{Smaller}(S_k, S_{k+1}) = 0 \]

for some \(k\)

where \(S_1 = \{\text{Smaller}(y_i, y_j)\}\) and

\[ S_2 = \{\text{Larger}(y_i, y_j) - \text{Smaller}(y_i, y_j)\} \]

where \(S_3 = \{\text{Smaller}(S_1, S_2)\}\) and

\[ S_4 = \{\text{Larger}(S_1, S_2) - \text{Smaller}(S_1, S_2)\} \]

where \(S_4 = \{\text{Smaller}(S_3, S_4)\}\) and

\[ S_5 = \{\text{Larger}(S_3, S_4) - \text{Smaller}(S_3, S_4)\} \]

\[ \vdots \]

\[ \vdots \]

\[ \vdots \]

**Total Exhaustive Dissimilarity** \((y_i, y_j)\) =

\[ \text{Dissimilarity}(y_i, y_j) + \text{Dissimilarity}(S_1, S_2) + \text{Dissimilarity}(S_3, S_4) + \text{Dissimilarity}(S_4, S_5) + \cdots + \text{Dissimilarity}(S_k, S_{k+1}) \]

\[ \text{Smaller}(S_i, S_{i+1}) = 0 \]

for some \(l\)

where \(S_1 = \{\text{Smaller}(y_i, y_j)\}\) and

\[ S_2 = \{\text{Larger}(y_i, y_j) - \text{Smaller}(y_i, y_j)\} \]

where \(S_3 = \{\text{Smaller}(S_1, S_2)\}\) and

\[ S_4 = \{\text{Larger}(S_1, S_2) - \text{Smaller}(S_1, S_2)\} \]

where \(S_4 = \{\text{Smaller}(S_3, S_4)\}\) and

\[ S_5 = \{\text{Larger}(S_3, S_4) - \text{Smaller}(S_3, S_4)\} \]

\[ \vdots \]

\[ \vdots \]

\[ \vdots \]

**Total Exhaustive Similarity** and **Total Exhaustive Dissimilarity** for \((y_i, y_j)\)

Similarly, we can write the Total Exhaustive Similarity and Total Exhaustive Dissimilarity for \((y_i, y_j)\)

One can note that this notion of Future Average does not induct the Causal Nature of the Time Series Type Of Sequence.

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